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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/867,910	05/30/2001	Hisashi Adachi	MTS-3254US	7562

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EXAMINER	
TORRES, JUAN A	

ART UNIT	PAPER NUMBER
2631	

DATE MAILED: 05/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/867,910	ADACHI ET AL.
	Examiner	Art Unit
	Juan A. Torres	2631

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 January 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10 and 12-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10 and 12-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

The indicated allowability of claims 11-14 is withdrawn in view of the newly discovered reference(s) to Seto (US 6504636). Rejections based on the newly cited reference(s) follow.

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

The drawings were received on 02/17/2005. These drawings are accepted by the Examiner.

Specification

The modifications to the specification were received on 02/17/2005. These modifications are accepted by the Examiner.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 4-6 and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaji (US 5534827) and further in view of Seto (US 6504636).

As per claim 1 Yamaji discloses a transmitting circuit apparatus comprising: a first digital modulator (block 7) and a second digital modulator (block 8) for modulating an I signal and a Q signal which are multi-valued digital or analog baseband modulation signals, into a digital I signal and a digital Q signal, respectively, having the number of bits smaller than that of the baseband modulation signals; and a quadrature modulator for outputting a signal synthesized from the signals generated by modulating (two) carrier waves each having a phase perpendicular to each other by using the modulated I and Q signals, respectively (figure 2 column 6 line 64 to column 7 line10). Yamaji doesn't disclose an E/O converters each for converting the output signal of each of the first and second digital modulators into an optical signal having a wavelength different from each other; and O/E converters each for converting the optical signal transferred from each of the E/O converters into an electric signal; wherein the output signal of each of the O/E converters is input to the quadrature modulator thereby to perform amplitude modulation on each of the carrier waves. Seto discloses E/O converters each for converting the output signal of each of the first and second digital modulators into an optical signal having a wavelength different from each other (figure 15 block 10B, column 21 lines 16-31); and O/E converters each for converting the optical signal transferred from each of the E/O converters into an electric signal (figure 15 block 32B-1, column 21 lines 48-54); wherein the output signal of each of the O/E converters is input to the quadrature modulator thereby to perform amplitude modulation on each of the carrier waves (figure 15 block 32B-1, column 21 lines 48-54 with f_{L02} is a quadrature version of f_{L01}). Yamaji and Seto are analogous art because they are from the sarne

field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the transmitting circuit disclosed by Yamaji the optical communication system disclosed by Seto. The suggestion/motivation for doing so would have been to provide an optical communication system which can generate a radio frequency signal excellent in noise characteristics (Seton column 4 lines 56-59). Therefore, it would have been obvious to combine Yamaji with Seto to obtain the invention as specified in claim 1.

As per claim 2 Yamaji also discloses a first and second digital modulators to modulate the I and Q signals which are multi-valued digital baseband modulation signals into two-valued digital I and Q signals, respectively (figure 2 column 6 lines 20-23). Yamaji and Seto are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the transmitting circuit disclosed by Yamaji the optical communication system disclosed by Seto. The suggestion/motivation for doing so would have been to provide an optical communication system which can generate a radio frequency signal excellent in noise characteristics (Seton column 4 lines 56-59). Therefore, it would have been obvious to combine Yamaji with Seto to obtain the invention as specified in claim 2.

As per claim 4 Yamaji discloses the use of a band-pass filter for reducing unnecessary signals outside the transmission frequency band from the signals generated by modulating the carrier waves (figure 25 block 55 column 11 lines 58-59). Yamaji and Seto are analogous art because they are from the same field of endeavor.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the transmitting circuit disclosed by Yamaji the optical communication system disclosed by Seto. The suggestion/motivation for doing so would have been to provide an optical communication system which can generate a radio frequency signal excellent in noise characteristics (Seton column 4 lines 56-59). Therefore, it would have been obvious to combine Yamaji with Seto to obtain the invention as specified in claim 4.

As per claim 5 Yamaji also discloses the use of a band-pass filter connected to the output of a quadrature modulator (figure 26 block 53 column 11 lines 63-65). Yamaji and Seto are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the transmitting circuit disclosed by Yamaji the optical communication system disclosed by Seto. The suggestion/motivation for doing so would have been to provide an optical communication system which can generate a radio frequency signal excellent in noise characteristics (Seton column 4 lines 56-59). Therefore, it would have been obvious to combine Yamaji with Seto to obtain the invention as specified in claim 5.

As per claim 6 Yamaji also discloses a quadrature modulator with a first and a second digital RF modulator each for performing amplitude modulation on each carrier waves having a phase perpendicular to each other, the modulated I and Q signals control the first and second digital RF modulators to perform amplitude modulation on the carrier waves, the modulated signals are synthesized into a signal, and the signal is

then output (figure 2 column 6 line 64 to column 7 line10). Yamaji and Seto are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the transmitting circuit disclosed by Yamaji the optical communication system disclosed by Seto. The suggestion/motivation for doing so would have been to provide an optical communication system which can generate a radio frequency signal excellent in noise characteristics (Seton column 4 lines 56-59). Therefore, it would have been obvious to combine Yamaji with Seto to obtain the invention as specified in claim 6.

As per claim 12 Seto also discloses that the I and Q signals converted into optical signals each having a different wavelength are transferred through a common optical fiber (figure 15 block 10B, column 21 lines 16-31). Yamaji and Seto are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the transmitting circuit disclosed by Yamaji the optical communication system disclosed by Seto. The suggestion/motivation for doing so would have been to provide an optical communication system which can generate a radio frequency signal excellent in noise characteristics (Seton column 4 lines 56-59). Therefore, it would have been obvious to combine Yamaji with Seto to obtain the invention as specified in claim 12.

As per claim 13 Seto also discloses that each of the carrier waves is generated from the digital I or Q signal having been restored into an electric signal by each of the O/E converters (figure 15 block 32B-1, column 21 lines 48-54). Yamaji and Seto are analogous art because they are from the same field of endeavor. At the time of the

invention, it would have been obvious to a person of ordinary skill in the art to combine in the transmitting circuit disclosed by Yamaji the optical communication system disclosed by Seto. The suggestion/motivation for doing so would have been to provide an optical communication system which can generate a radio frequency signal excellent in noise characteristics (Seton column 4 lines 56-59). Therefore, it would have been obvious to combine Yamaji with Seto to obtain the invention as specified in claim 13.

As per claim 14 Seto also discloses another E/O converter for converting the output signal of a reference signal source into an optical signal having a wavelength different from those of the optical signals of the digital I and Q signals (figure 15 block 10B, column 21 lines 16-31); and an O/E converter for converting the optical signal transferred from the E/O converter into an electric signal (figure 15 block 32B-1, column 21 lines 48-54) where the carrier waves are generated from the output signal of the O/E converter (figure 15 block 32B-1, column 21 lines 48-54). Yamaji and Seto are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the transmitting circuit disclosed by Yamaji the optical communication system disclosed by Seto. The suggestion/motivation for doing so would have been to provide an optical communication system which can generate a radio frequency signal excellent in noise characteristics (Seton column 4 lines 56-59). Therefore, it would have been obvious to combine Yamaji with Seto to obtain the invention as specified in claim 14.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaji and Seto as applied to claim 1 above, and further in view of Karema (US 5061928).

Yamaji and Seto disclose claims 1 or 2. Yamaji and Seto don't specify the order of the sigma-delta modulator. Karema discloses the use of high-order sigma-delta modulators to increase the signal to noise ratio of the modulator (column 1 lines 45-49). Yamaji, Seto and Karema are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the transmitting circuit disclosed by Yamaji and Seto with the sigma-delta modulator of order second and higher disclosed by Karema. The suggestion/motivation for doing so would have been to reduce the quantification noise in the modulator (Karema column 1 lines 7-14). Therefore, it would have been obvious to combine Yamaji and Seto with Karema to obtain the invention as specified in claim 3.

Claims 7, 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaji and Seto as applied to claim 1 above, and further in view of Camp (US 6194963).

As per claim 7 Yamaji and Seto disclose claim 6. Yamaji and Seto don't disclose that each of the first and second digital RF modulators comprises a power amplifier, and each of the modulated I and Q signals controls the power supply of each power amplifiers to perform amplitude modulation on each of the carrier waves, and the amplitude-modulated signals are synthesized into an output signal of the quadrature modulator. Camp discloses a power amplifier, where each of the modulated I and Q signals controls the power supply of each power amplifier to perform amplitude modulation (figure 1, column 2 lines 50-52). Yamaji, Seto and Camp are analogous art because they are from the same field of endeavor. At the time of the invention, it would

have been obvious to a person of ordinary skill in the art to modify the transmitting circuit disclosed by Yamaji and Seto with the power amplifier disclosed by Camp. The suggestion/motivation for doing so would have been to increase the efficiency of the power amplifiers (Camp abstract). Therefore, it would have been obvious to combine Yamaji and Seto with Camp to obtain the invention as specified in claim 7.

As per claim 8 Yamaji and Seto disclose claim 6. Yamaji and Seto don't disclose that the digital RF modulators comprises an amplitude modulator, a power amplifier and the carrier waves are modulated using the modulated I and Q signals by amplitude modulators, and then amplified by the power amplifiers the amplified signals are synthesized into an output signal of the quadrature modulator. Camp discloses a method to modulate independently the phase and the amplitude of the I and Q signals, modulating the amplitude using and amplitude modulator and a power amplifier (figure 1 column 3 lines 23-47). Yamaji, Seto and Camp are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the transmitting circuit disclosed by Yamaji and Seto with the power amplifier disclosed by Camp. The suggestion/motivation for doing so would have been to increase the efficiency of the power amplifiers (Camp abstract). Therefore, it would have been obvious to combine Yamaji and Seto with Camp to obtain the invention as specified in claim 8.

As per claim 10 Yamaji, Seto and Camp disclose claim 7. Camp discloses that power amplifiers provide the RF output signal and constitutes a final amplifying stage, and hence no amplification circuit for the transmission signal is provided in the circuit in

the stages after the quadrature modulator (column 1 lines 59-61). Yamaji, Seto and Camp are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the transmitting circuit disclosed by Yamaji and Seto with the power amplifier disclosed by Camp. The suggestion/motivation for doing so would have been to increase the efficiency of the power amplifiers (Camp abstract). Therefore, it would have been obvious to combine Yamaji and Seto with Camp to obtain the invention as specified in claim 10.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaji and Seto as applied to claim 6 above, and further in view of Sugimura (US 6002301). Yamaji and Seto disclose claim 6. Yamaji and Seto don't disclose the use of a dual-gate FET as a power amplifier. Sugimura discloses that one conventionally well-known power amplifier, especially a power amplifier for amplifying high-frequency signals, is the one which employs a dual-gate FET (column 1 lines 10-14). Yamaji, Seto and Sugimura are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the transmitting circuit disclosed by Yamaji and Seto with the dual gate FET disclosed by Sugimura. The suggestion/motivation for doing so would have been to to reduce power consumption of the system (Sugimura column 1 lines 10-15). Therefore, it would have been obvious to combine Yamaji and Seto with Sugimura to obtain the invention as specified in claim 9.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaji, Seto and Karema as applied to claim 3 above, and further in view of Ribner (US 5682161). Yamaji, Seton and Karema disclose claim 3. Yamaji, Seto and Karema don't disclose the use of a n-th-order integrator, a quantizer, and a feedback circuit, a value input to the n-th-order integrator undergoes n-th-order integration and is then input to the quantizer to be quantized into a digital value, the value serves as the output signal of the sigma-delta modulator, and at the same time, is in put to the feedback circuit, and the output signal of the feedback circuit is added to the input value of the sigma-delta modulator and the result is input to the n-th-order integrator. Ribner discloses high-order sigma-delta modulators where the sigma-delta modulators comprises an n-th-order integrator, a quantizer, and a feedback circuit, a value input to the n-th-order integrator undergoes n-th-order integration (figure 6 blocks 252, 254..), and is then input to a quantizer to be quantized into a digital value (figure 6 block 210), wherein the quantized value serves as the output signal of the sigma-delta modulator, and at the same time, is in put to the feedback circuit, and wherein the output signal of the feedback circuit is added to the input value of the sigma-delta modulator and the result is input to the n-th-order integrator (figure 6 column 6 lines 61-77 and equation 13). Yamaji, Seto, Karema and Ribner are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the transmitting circuit disclosed by Yamaji, Seto and Karema n-th order delta-sigma modulator use the modulator described by Ribner. The suggestion/motivation for doing so would have been to improve the resolution of the sigma-delta modulator

(Ribner abstract). Therefore, it would have been obvious to combine Yamaji, Seto and Karema with Ribner to obtain the invention as specified in claim 15.

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaji, Seto and Karema as applied to claim 3 above, and further in view of Ritoniemi (US 5629701). Yamaji, Seton and Karema disclose claim 3. Yamaji, Seto and Karema don't disclose that the sigma-delta modulator comprises a plurality of lower-order sigma-delta modulators connected in multi-stage, the output signal of each of the plurality of lower-order sigma-delta modulators is synthesized by connecting the output to a differentiator having a configuration expressed by a z transform $(1-z^{-1})^{m}$ with the degree m up to the preceding stage. Ritoniemi discloses a plurality of lower-order sigma-delta modulators connected in multi-stage, the output signal of each of the plurality of lower-order sigma-delta modulators is synthesized by connecting the output to a differentiator having a configuration expressed by a z transform $(1-z^{-1})^{m}$ with the degree m up to the preceding stage (figure 1 column 3 lines 51-66). Yamaji, Seto, Karema and Ritoniemi are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the transmitting circuit disclosed by Yamaji, Seto and Karema to use a plurality of lower order sigma-delta modulators with a differentiator described by Ritoniemi. The suggestion/motivation for doing so would have been to reduce the quantizing error of the sigma-delta modulator (Ritoniemi abstract). Therefore, it would have been obvious to combine Yamaji, Seto and Karema with Ritoniemi to obtain the invention as specified in claim 16.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaji, Seto and Karema as applied to claim 3 above, and further in view of Borth (US 4775851). Yamaji, Seton and Karema disclose claim 3. Yamaji, Seto and Karema don't disclose that the output the sigma-delta modulators are provided with a digital filter having low-pass characteristics. Borth (US 4775851) teaches a sigma-delta modulator where the output of the sigma-delta modulators is provided with a digital filter having low-pass characteristics (figure 3, column 8 lines 7-10). Yamaji, Seto, Karema and Borth are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the transmitting circuit disclosed by Yamaji, Seto and Karema to use to use a low-pass FIR filter at the output of the sigma-delta modulator as discloses by Borth. The suggestion/motivation for doing so would have been to reduce the out of band quantification noise of the sigma-delta modulator (Borth column1 lines 8-15). Therefore, it would have been obvious to combine Yamaji, Seto and Karema with Borth to obtain the invention as specified in claim 17.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is (571) 272-3119. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone

number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Juan Alberto Torres
4-21-05